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NOISE EFFECT OF BUILDING INSTALLATION EQUIPMENT

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Abstract

Environmental state of domiciliation influenced basically by the noise load, which nowadays is the most important quality criterion. The paper shows investigation of authors and conclusions about actual questions of building installation equipment noise.

Rezumat

Calitatea mediului înconjurător al locuințelor este esențial influențată de nivelul de zgomot, care, în zilele noastre este un criteriu calitativ important. Lucrarea prezintă cercetările şi concluziile autorilor privind problemele actuale de zgomot ale echipamentelor instalațiilor interrioare din clădiri.

1. INTRODUCTION

Environmental state of domiciliation influenced basically by the noise load, which nowadays is the most important quality criterion. Noise load evolution is developed by several human activities, industry, transportation and building installation equipment operation. Along with industrial progression, the number of building installation (e.g. ventilating and air-conditions) equipment used to assure well-being increases. It entails increasing of background noise and other environmental load, decreasing or disappearance of soundless areas.

This paper will show investigation of authors and conclusions about actual questions of building installation equipment noise. The paper will be organized as follows: Section 2 shows the noise load and background noise in different areas. Section 3 words noise emission of building installation equipment. Section 4 presents theoretical questions of oise emission and changing of neighborhood noise-condition. Section 5 shows the conclusions.

2. Noise load and background noise in different areas

Results of noise measures, which are done at given areas but different times, show modification of noise load and background noise. Nowadays the background load is investigated instead of background noise, because of complexity of domiciliation from point of view of noise protection. But which is the difference between background noise and background load?

ackground noise: noise generated by not investigated equipment at the site and time of measurement which disturbs measurement. Its disturbances cannot be eliminated.

Background load: noise load in the range of investigated noise source, which is arised without work of noise source, but analogous to it.

In pursuance of measurements, in the cities and in the built-up area by dwelling-houses high background noise can be detected, which are near of the limiting values. Is it very difficult to identify the other (not-investigated) noise source, and its position.

The noise load has been measured in different built-up area and in different living space. The subjective-valued sound effects can be compared by recorded A-acoustical pressure levels. the noise generated by buildings or building installation equipment was investigated at clear of

transportation (nightly) time intervals. Measuring locations and they characters were:

I. ***large town neighborhood***, eleven-storied housing estate with shopping center and parking house;

II. ***townlet neighborhood***, one or two-storied housing estate with small shops and office-block;

III. ***private house neighborhood***, with big yards, there are not engineering noise sources.

Noise levels taken down in locations mentioned above can be seen in Figure 1.

During our investigation sub- and over auditory sensation area noise levels have been measured for more correctly interpretation. A special situation has been investigated, namely the noise of cricket has been measured. It can be seen that this noise shows up only in a small frequency range, but increases the equivalent noise level, which is adequated by the law, significantly. This increasing can prohibit qualification of building installation noise source.

The Table 1. shows the equivalent acoustical pressure levels.

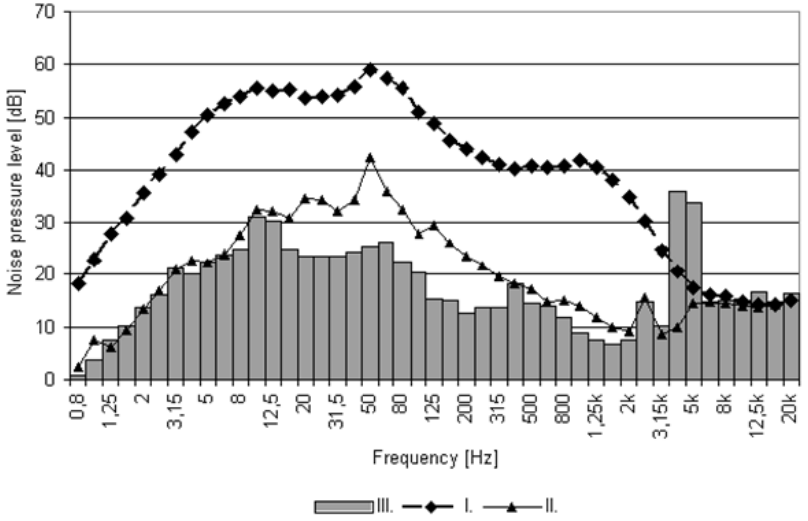

Figure 1. Noise levels measured in different built-up area

I.	*II.*	*III.*
L_{Aeq} = 49,1 dB	L_{Aeq} = 25,8 dB	L_{Aeq} = 38,7 dB

Table 1. Equivalent noise levels

It can be seen that data measured large town and townlet neighborhood have similar characters in 16 Hz — 20 kHz and sub-auditory sensation intervals.

I.	*II.*	*From ventilator*
L_{Aeq} = 49,1 dB	L_{Aeq} = 25,8 dB	L_{Aeq} = 44,9 dB

Table 2. Background noise and ventilator's equivalent noise levels

Noise of ventilator located in roof of shopping center was measured. The loading point was 30 meters from noise source in third storage of a dwelling house. Investigated equipment, which applied widely, can be seen in figure 2. Table 2. shows equivalent noise levels measured in different built-up area and investigated ventilator's one.

It is important to mention, that shown noise load is influenced by its setting-in and other circumstance.

Measured results show, for environmental noise famed as quiet noise of ventilator is well-detectable, and it influences noise level of its neighborhood. Frequency functions of background and load noise is shown by figure 3.

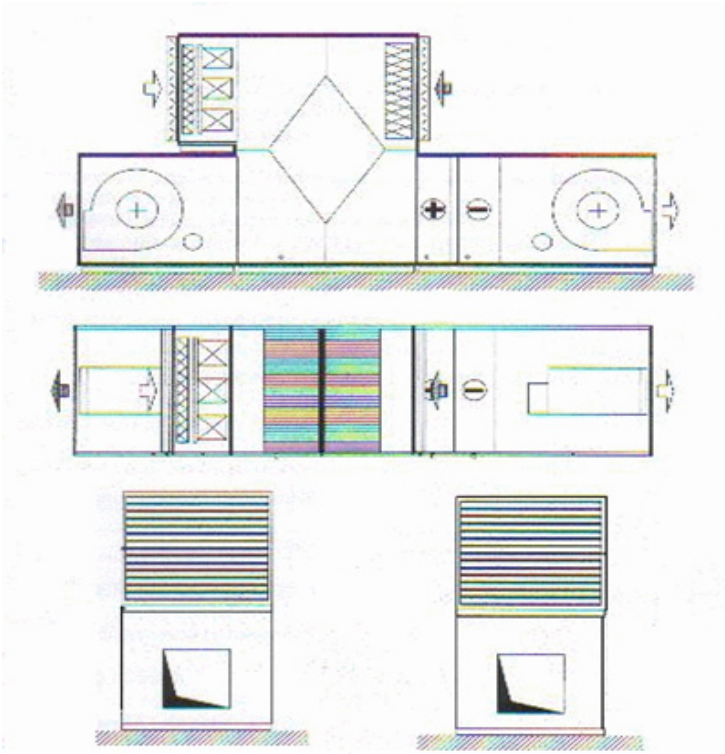

Figure 2. Ventilator's location whit typical noise pressure levels

It is observable in bases of measured equivalent noise levels, that in a quiet neighborhood lower noise level of building installation can be detected, as in large town one. In case of investigation in large town neighborhood, well-determinable noise sources cannot be identified, characters of noise pressure levels are determined by noise effects which proceed together.

On the other hand, noise extracted by building installation equipment does not exceed background noise of large town neighborhood, and only in 125 – 500 Hz interval approaches it. Clean-cut noise-overlays cannot be seen, but noise level – frequency functions are similar.

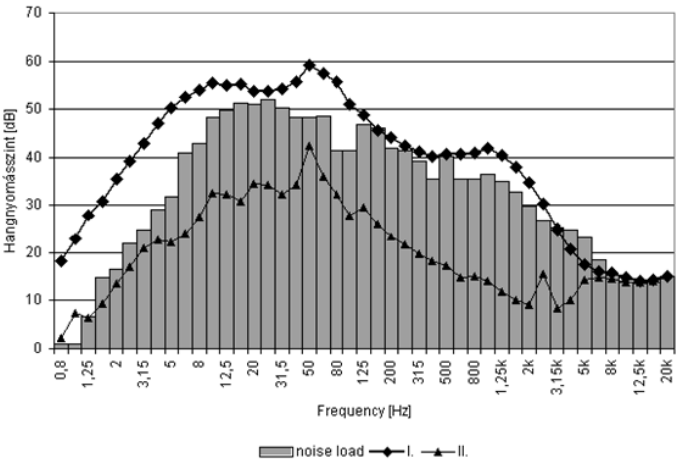

Figure 3. Background noise levels depend on frequency

3. NOISE EMISSION ON BUILDING INSTALLATION EQUIPMENT

For locating and operation of noise source it should be investigated, that noise load located by building installation equipment. At the same time there is another question, namely that new noise source how changes noise-condition of neighborhood, id est. background noise and noise load.

During planning and locating of building installation equipment, experts should draw comparison with required limiting values, to decide given equipment is good or not from this point of view. This method is not too good from environmental protection point of view because in case of low background noise, the equipment can change noise-condition of neighborhood largely. New equipment can generate 8–10 dB increasing. For its avoidance, possible methods should be investigated and developed along with requirements.

New method used in case of building installation equipment is the investigation and classification of affected zone. To determine the affected zone, noise load accrues from equipment, base condition of neighborhood and required limiting values should be used. It can create a problem, that background noise is equal of higher then required limiting values. In this case measurement and valuation of equipment noise is impossible.

Table 3. and Table 4. shows noise levels accrues from few

ventilators used basically in the industry. Data used to preliminary planning and minded for measurement were integrated in the tables.

Noise pressure level of ventilator [L_W]. delivery capacity: $V_{nom.}$ = 10 000 m^3/h									
Frequency	complete	63 Hz	125 HZ	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
inlet side L_W	91,5 dB	83 dB	83 dB	91 dB	89 dB	89 dB	73 dB	71 dB	61 dB
delivery side L_W	85,3 dB	82 dB	84 dB	87 dB	84 dB	80 dB	75 dB	64 dB	57 dB
casing L_W	71,0 dB	81 dB	78 dB	77 dB	64 dB	64 dB	41 dB	35 dB	22 dB

Table 3. Noise levels of ventilators

Noise pressure level of ventilator [L_p]. delivery capacity: $V_{nom..}$ = 10 000 m^3/h									
Frequency	complete	63 Hz	125 HZ	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
inlet side $L_{p\,2\,m}$	77,2 dB	72 dB	73 dB	72 dB	70 dB	76 dB	62 dB	63 dB	56 dB
delivery side L_{p2m}	70,8 dB	71 dB	74 dB	68 dB	65 dB	67 dB	64 dB	56 dB	52 dB
casing $L_{p\,2\,m}$	50,2 dB	60,2 dB	57,2 dB	56,2 dB	43,2 dB	43,2 dB	20,2 dB	14 dB	1,2 dB

Table 4. Noise levels of ventilators

4. NOISE EMISSION AND CHANGING OF NEIGHBORHOOD NOISE-CONDITION

In case of average (10.000 m^3/hour) ventilator higher sound power and higher radiated sound pressure should be observed, which change

background noise level in its vicinity. Therefore the noise has to decreased, mainly in the open air installation of equipment. Applied noise decreasing method is determined by required limiting values and equipment how overpasses them. From technical and economical point of view, noise decreasing tries to make only equality of two parameters mentioned above. Therefore in low-background noise places the noise load will increase after appointment of building installation equipment. It implies several environmental problems such as:

1 noise-condition of neighborhood will deteriorate, noise load will increase;
2 quiescent neighborhood cannot be assigned, because more religious limiting values cannot be required;
3 from higher background load, noise load will be continuous in the continuous, other building installation equipment cannot be operated, which can restrict evolution of domiciliation.

During operation of noise sources it should be minded that neighborhood of working place demands preservation from other point of view. For example it can be neighborhood of hospitals, schools, recreation zones and pigeon-hole of birds. Therefore it is very important that required limit values of nature reserve areas have to be determined in the future.

Figure 4 shows the changing of background load and noise-condition, where background noise and noise accrues from building installation equipment can be seen.

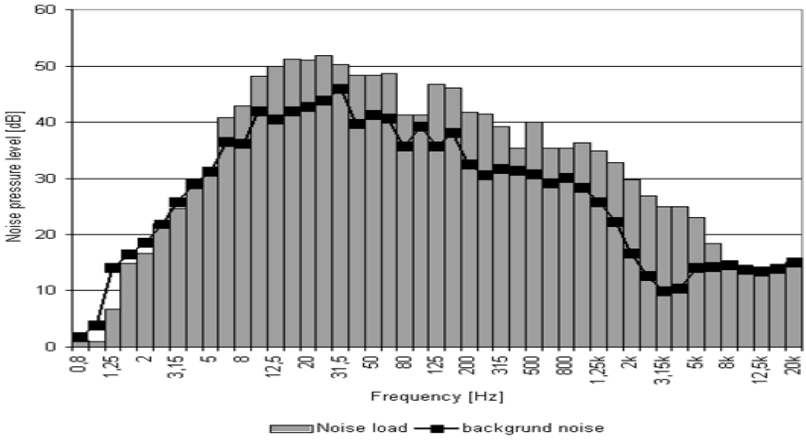

Figure 4. Increasing of background noise by noise arise from building installation equipment

5. CONCLUSIONS

Bases of our investigation several conclusions can be worded. To save the environment following recommendations should be minded:

1 Background noise is very different in dissimilar conditions. Therefore condition of operation of building installation equipment is determined by basic environmental conditions.
2 During new locating of building installation equipment it should be observed not only required limiting levels, but evolution of domiciliation the future has to be ensured.
3 Environmental load increasing continually filling out limiting levels terminates other building installation equipment operation in given domiciliation.

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